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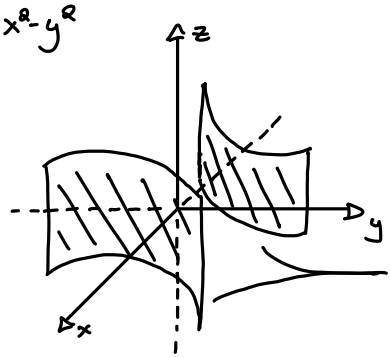
Dr. Gustafson
MATH 360
HW 9.4

9.4 - 1,5,11,19,24 ✓

9.4 #1 T=9

$T = x^2 - y^2$



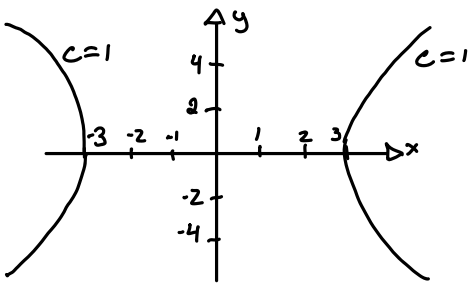
These two curves are Hyperbolas

$9 = x^2 - y^2$

$y^2 = x^2 - 9$

$y = \pm\sqrt{x^2-9}$ $\quad -3 > x < 3$

x	y
-5	±4
-4	±√7
-3	0
3	0
4	±√7
5	±4



9.4 #5

$T = \frac{y}{x^2+y^2}$ $\quad T=1$

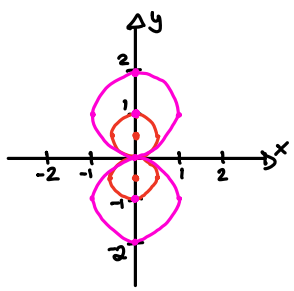
$x^2+y^2 = \frac{y}{T}$

$x^2+y^2-\frac{y}{T} = 0$

$x^2+y^2-\frac{1}{T}y = 0$

$x^2 + y^2 - \frac{1}{T}y + \frac{1}{4T^2} = \frac{1}{4T^2}$

$x^2 + (y-\frac{1}{2T})^2 = \frac{1}{4T^2}$ ⟶ Circle centered at $(0, \frac{1}{2T})$ With radius $r = |\frac{1}{2T}|$



$T=\pm 1$ $\quad T=\pm\frac{1}{2}$

9.4 #11

$f(x) = 5x^2 + 2y^2 \qquad f(x) = 1$

$1 = 5x^2 + 2y^2 \qquad 1 = \frac{x^2}{a^2} + \frac{y^2}{b^2}$

$a^2 = \frac{1}{5} \quad b^2 = \frac{1}{2}$

$\therefore$ This equation resembles a cylinder

$1 - 5x^2 = 2y^2$

$\frac{1}{2} - \frac{5}{2}x^2 = y^2$

$y = \pm\sqrt{\frac{1}{2} - \frac{5}{2}x^2}$

$\frac{1}{2} - \frac{5}{2}x^2 = 0$

$\frac{1}{2} = \frac{5}{2}x^2$

$1 = 5x^2$

$\frac{1}{5} = x^2$

$x = \pm\sqrt{\frac{1}{5}}$

$-\sqrt{\frac{1}{5}} < x < \sqrt{\frac{1}{5}}$

$5x^2 = 1 - 2y^2$

$x^2 = \frac{1}{5} - \frac{2}{5}y^2$

$x = \pm\sqrt{\frac{1}{5} - \frac{2}{5}y^2}$

$\frac{1}{5} - \frac{2}{5}y^2 = 0$

$\frac{1}{5} = \frac{2}{5}y^2$

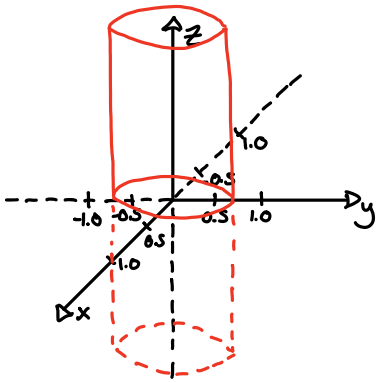
$1 = 2y^2$

$\frac{1}{2} = y^2$

$y = \pm\sqrt{\frac{1}{2}}$

$-\sqrt{\frac{1}{2}} < y < \sqrt{\frac{1}{2}}$

This equation is a cylinder.

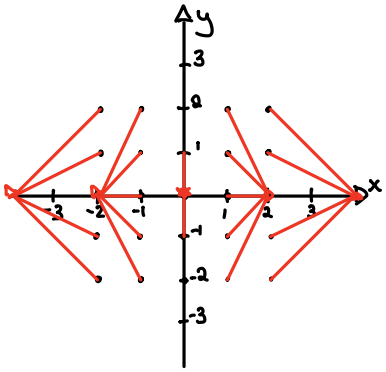


9.4 #19

$V = x\hat{\imath} - y\hat{\jmath}$

x	y	V
-2	-2	$-2\hat{\imath} + 2\hat{\jmath}$
-2	-1	$-2\hat{\imath} + 1\hat{\jmath}$
-1	-2	$-\hat{\imath} + 2\hat{\jmath}$
-1	-1	$-\hat{\imath} + \hat{\jmath}$
-1	0	$-\hat{\imath} + 0\hat{\jmath}$
0	-1	$0\hat{\imath} + \hat{\jmath}$
1	0	$\hat{\imath} - 0\hat{\jmath}$
0	1	$0\hat{\imath} - \hat{\jmath}$
1	1	$\hat{\imath} - \hat{\jmath}$
2	1	$2\hat{\imath} - \hat{\jmath}$
1	2	$\hat{\imath} - 2\hat{\jmath}$
2	2	$2\hat{\imath} - 2\hat{\jmath}$

x	y	V
-2	2	$-2\hat{\imath} - 2\hat{\jmath}$
-2	1	$-2\hat{\imath} - \hat{\jmath}$
-1	2	$-\hat{\imath} - 2\hat{\jmath}$
-1	1	$-\hat{\imath} - \hat{\jmath}$
1	-1	$\hat{\imath} + \hat{\jmath}$
1	-2	$\hat{\imath} + 2\hat{\jmath}$
2	-1	$2\hat{\imath} + \hat{\jmath}$
2	-2	$2\hat{\imath} + 2\hat{\jmath}$



9.4 #24

$V_1 = [e^x\cos(y), e^x\sin(y)]$

$V_2 = [\cos(x)\cosh(y), -\sin(x)\sinh(y)]$

$\frac{\partial V_1}{\partial x} = [e^x\cos(y), e^x\sin(y)]$ $\qquad \frac{\partial V_2}{\partial x} = [-\sin(x)\cosh(y), -\cos(x)\sinh(y)]$

$\frac{\partial V_1}{\partial y} = [-e^x\sin(y), e^x\cos(y)]$ $\qquad \frac{\partial V_2}{\partial y} = [\cos(x)\sinh(y), -\sin(x)\cosh(y)]$